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Management Values in the Selection of a Capital Budgeting Portfolio

By

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Introduction

Studies of managerial decision making have usually focused upon one of three approaches. Some researchers have examined the behavior of the individual manager, both descriptively and normatively. Given limited information and positive costs of search, the conclusions here have emphasized the concept of bounded rationality, the replacement of inoperable goals with operable ones, the use of multiple attributes to resolve uncertainty, a concern with risk, and the departmental identification of executives.*

Other studies have focused upon firm pricing behavior where the reactions of a given manager have reflected the particular activity and values of the corporation. The conclusions have been that executives generally do not have profit maximization as a single goal, that current management knowledge of cost and revenue functions is not sufficient to maximize profits, and that the organizational interactions required in the firm limit the manager's ability to pursue a single goal even if that were desired. Often, firms have been suggested as pricing in order to realize a targeted return on investment in conjunction with a market share performance. Pricing was designed to meet or to prevent competition, or to stabilize prices and margins in the long run in some cases. Ultimately, these heuristic rules may operate to maximize long-run profits. However, in the short run, the conclusion has been that managements pursue many goals in addition to profits.**

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*See Alderfer and Bierman (1970), Conrath (1973), Dearborn and Simon (1958), Mao (1970), Miller (1956), Simon (1957), and Slovic (1972) for example.

**See Baldwin (1964), Baumol (1954), Chamberlain (1962), Cyert and MacCrimmon (1967), Gale (1972), Katona (1951), Lanzillotti (1958), National Industrial Conference Board (1966), Shubik (1961), and Spitaller (1971). The NICB and Spitaller studies deal with investment abroad.

Coinciding with an analysis of the single manager or of the manager within the organization, a third group of researchers have emphasized the organization per se, and have suggested that short-term tenure in a given assignment and the decision process within the organization often meant that capital budgeting projec and prices were evaluated and approved on the basis of a variety of seemingly noneconomic variables. The impact of increased information, group versus individual decisions regarding risk evaluation, and the control process all affected the forecasts and decisions process surrounding project approval. The Cyert and March (1963) concepts of conflict resolution, uncertainty avoidance, problemistic search, and organization adaptation were used as major explanatory variables by these authors to explain the "behavioral" theory of firm behavior. Broadening these concepts to emphasize the capital budgeting and strategy decisions, Carter (1971) stressed the impact of multiple organizational levels, bilateral bargaining between a sponsor and a manager, the impact of technology, and ex post uncertainty resolution by the Pollyanna-Nietzsche effect. Finally, others have seen organizations as essentially"organized anarchy," with special reference to universities; there is problemistic references to the given situation; unclear technology; and fluid participation (Cohen, et al.(1972)).*

From all of these studies, there is evidence that a variety of goals are pursued even though some may be the operational goals for long-run profit maximization. Major interdependencies between projects in the capital budgeting decision as well as a concern with risk, variously defined, are also involved.

Concurrent with these studies has been the improved analysis of the capital budgeting problem. An increased analytical basis for the capital budgeting problem, the successful introduction of these analytical techniques in businesses,

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*Among the studies in addition to those mentioned are Berg (1963), Bower (1970), March and Simon (1953), Mintzberg (1973), Rotch (1958), Shaw and Penrod (1962), Wallich et al.(1962), and Woods (1965).

the development of various management science models in the last 25 years and their successful implementation in some corporations, and the deepening of the analytical framework for the broader issues of corporate strategy have all served to emphasize the need for increased awareness of the values of the managerial decision maker.*

To learn more about the decision process and the values pursued by executives in a management setting, an interactive simulation program was developed which was then used with individuals and groups of middle managers who were participating in a management program at a school of business administration. Materials were developed to place them in a hypothetical capital budgeting decision situation and questionnaires were used to obtain their judgments on the desirability of various projects. The remainder of this paper is concerned with their decisions and the implications of those decisions for management.

In this paper we seek evidence on six issues:

First, are there different goals and attitudes toward risk depending on the professional background of executives?

Second, are there different goals and attitudes toward risk depending on the regional background of the executives?

Third, if there are multiple goals in the mind of the executive, how does (s)he filter projects in the capital budgeting setting? Does (s)he effectively find projects which realize his/her primary goals?

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*Among appropriate references for the use of capital budgeting techniques and models in corporations, see Fremgen (1973), Gershefski (1970), Klammer (1972) and Schrieber (1970). Analysis of the capital budgeting decisions may be seen in Hillier (1969) and Jean (1970), among other sources. An excellent recent discussion of strategy is Cohen and Cyert (1973).

Fourth, how does (s)he cope with risk? When given the information and the tools (e.g., computer assisted analysis), does (s)he attempt to deal with risk in an explicit form?

Fifth, with different project rankings under rate of return and present value criteria, the evaluation of leases, and the importance of looking at rate of return or present value in a portfolio context rather than simply adding projects, does the executive react to these financial subtleties in a consistent and logical manner?

Sixth, how do groups differ from individuals in the portfolio selection process?

The Decision Environment

The men and women in this experiment were typically 30 to 45 years old, with a minimum of eight years of managerial experience. About 40% were non-United States citizens working in other lands. Some were military career officers in the United States Navy and Air Force. Many were from small firms, but the majority were from major corporations. All had been selected by their companies to attend a fourteen-week executive development program, and had completed eleven weeks of that program at the time of this study.

The essential information about the situation was given to the managers in two separate packages. The first package (or (A) case) consisted of brief outlines of 20 projects with tables of the expected outcome and standard deviation of the outcome on ten criteria for each of the projects. The criteria were net present value, and the impact on cash flow, on earnings per share, and on sales for each of the next three years. As additional information each project's rate of return and profitability index were provided

together with the expected cost of the project.* Participants were given a general budget ceiling, but it was emphasized that this was a flexible limit.

The company was described as a family-owned, diversified manufacturer of specialty machine equipment for various industries. In the most recent year, sales were $10,500,000 and earnings were $950,000. Earnings per share had grown from $2.50 three years ago to $4.75 in the most recent year. The firm was considering an additional issue of stock, and becoming a public company. This stock issue was expected to dilute current earnings per share to $3.41. In addition participants were given information relating to previous years' cash flow, depreciation and capital outlays, as well as income statements and balance sheets for the preceding three years. For those participants unfamiliar with simulation, a brief description of the technique was presented.

*In terms of the mean/variance approach used for the project portfolio evaluation in SIFT, one can argue that the correct discount rate is the risk-free rate, which would be less than the 10% rate employed in the raw data. Thus, the manager discounts the cash flows for time, but should not discount them for risk. The risk-adjustment is made when the portfolio is selected using the appropriate mean-variance trade-off the manager wishes to apply. Hence, a more appropriate rate would be lower, perhaps 6%. See, for example, Bierman and Haas (1973) and Keeley and Westerfield (1972). An opposite approach is to adjust the discount rate, raising it for the riskier projects. This conclusion is consistent with the traditional cost of capital model. It is also consistent with the capital asset model, for the risk free rate and the expected covariance of the project with the market combine to produce variable discount rates for riskier (i.e., higher covariance) projects ex ante. However since one purpose of this SIFT study was to analyze the manner in which the executives coped with variance as a risk measure, a uniform discount rate was used throughout.

The second package (or (B) case) included a brief description of portfolio theory and presented the correlation coefficient matrix for all of the projects on each of the ten criteria.*

In conjunction with the (B) case, the computer program SIFT was made available. This program allowed a participant to observe the effects of his/her decision on the portfolio. For any portfolio, the calculations presented the expected outcome and the variability of that outcome on any criterion the participant wished to examine. These results were derived by combining the means and variances/covariances for the projects the executive selected. As the participant signed on to the system, (s)he was asked to state the goals and to select an initial portfolio from among the projects. Certain illegal project combinations (e.g., one of two new products might be accepted, but not both) as well as the forced inclusion of the current operation (Project 1) were imbedded. Should these constraints be violated, error messages would be returned.

When an executive first connected to the SIFT system, (s)he would receive a welcoming message and an explanation of the common codes which were available to him, as shown in Table 1.

In using this SIFT program, the executive had a number of filtering options available.

1. The program could be used to determine portfolio data. SIFT would present the capital outlay and the results for any of the criteria for any legal combination of projects. As noted the program would include costs for debt as required.

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*Early preliminary testing indicated that correlation coefficients were more readily used by executives than the covariances. Accordingly, this measure was presented to them for these studies. These factors are discussed in detail in Carter (1974), Chapter 6.

Table 1

SIFT Sign-On Message

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WELCOME TO THE COULTER CORPORATION CAPITAL BUDGETING SIMULATION

WHAT IS YOUR NAME(S)?G. WELLS,A. MILES

PLEASE EXPLAIN YOUR OBJECTIVES ON THE NEXT THREE LINES
?TO MAXIMIZE
?EPS IN
?YEAR 3

MAXIMUM BUDGET LIMIT =$ 8000


WHEN THE COMPUTER TYPES -OPTION?- PLEASE ANSWER
WITH ONE OF THE RESPONSES SHOWN BELOW

OPTION              DESCRIPTION
======    ========================================
   NP      STARTS A NEW PORTFOLIO
   PC      PORTFOLIO CONTENTS
   EC      LIST PROJECT ENTRY COSTS
   IP      LIST ILLEGAL PROJECT COMBINATIONS
   A       ADD A NEW PROJECT TO YOUR PORTFOLIO
   D       DELETE A PROJECT FROM YOUR PORTFOLIO
   P       PORTFOLIO STATISTICS
   SP      SHORT PORTFOLIO OUTPUT
   C       COMBINE PROJECTS
   MR      RANK PROJECTS BY MEAN VALUES
   VR      RANK PROJECTS BY VARIABILITY(STD. DEV.)
   END     STOPS PROGRAM


WHEN THE COMPUTER TYPES -CRITERION?- PLEASE ANSWER
WITH ONE RESPONSES SHOWN BELOW

CRITERION           DESCRIPTION
========= ====================================
   S1      SALES IN YEAR 1
   S2      SALES IN YEAR 2
   S3      SALES IN YEAR 3
   CF1     CASH FLOW IN YEAR 1
   CF2     CASH FLOW IN YEAR 2
   CF3     CASH FLOW IN YEAR 3
   EPS1    EARNINGS PER SHARE IN YEAR 1
   EPS2    EARNINGS PER SHARE IN YEAR 2
   EPS3    EARNINGS PER SHARE IN YEAR 3
   NPV     NET PRESENT VALUE

TYPE  -HELP- TO RETYPE THE ABOVE INFORMATION
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2. Confidence levels using Normality assumptions were printed for the portfolios chosen by the executive for whatever criteria. These confidence intervals used the standard deviations of the portfolio to compute 25%/75%, 10%/90%, 5%/95% and 1%/99% intervals for the criteria as the executive requested.

3. Compare/Combine options permitted the participant to study the effectiveness of the proposed portfolio vis-à-vis the current operation in meeting various goals for future years. For example, the executive could view the probability that earnings per share in the second year would be no less under his proposed portfolio than expected second-year earnings per share of the existing firm alone.

4. Portfolio-project comparisons permitted the executive to view how the proposed portfolio would be altered for each of the ten criteria by adding or deleting a particular project. These results were similar to those obtained for the existing firm/portfolio comparison indicated above. The comparison indicated the amount by which the expected values and standard deviations of the portfolio would be changed by addition or deletion of a project.

5. Mean search routines permitted the executive to seek altered values from the expected outcome of the portfolio for any criterion. When using this option, the participant indicated the criterion and the number of proposals desired (N). The program printed the N projects which would have the greatest effect in increasing or decreasing the expected value under consideration. Depending on what the participant specified, the program would review all projects, those in the proposed portfolio, or those out of the proposed

portfolio. The participant's specification, of course, depended upon whether he was attempting to eliminate projects from his portfolio which had an unfavorable impact on a criterion (e.g., a binding budget constraint and low earnings per share in the first year) or to add projects which would improve an outcome (e.g., find projects to boost sales in the second year).*

6. Variance search routines required the participant to input the same information as under the mean search routine. The program would return a list of those projects in and/or out of the current portfolio which would most increase or decrease the variance on a given criterion.

After reviewing each of the (A) and the (B) cases, the participants were asked to complete a questionnaire. This questionnaire asked them to indicate the projects they would like to have in their final portfolio, the reasons for that portfolio, and their goals. They also were asked to indicate the time spent on the assignment. For the (B) case, the same questions were asked together with time spent on the computer in the event they used it. In addition, they were asked to attach their computer output to the questionnaire.

Evaluation of Data

The participants' responses to the questionnaire were codified into Goals, Constraints, and Risk considerations. Goals were identified as the major factor in which there was an implied or stated optimization process. There could be more than one major goal for a subject. However, often the multiple attributes of the decision were included as "a reasonable growth in sales," for example, and such a codification was taken as a Constraint, where the objective was to meet some minimal level of achievement. Beyond that level, it was assumed that the criterion was not of paramount importance. Finally, the aspect of Risk was considered important if the executive

*Since the portfolio model operated on the basis of a Normality assumption, the mean is an acceptable average. In typical risk analysis models for a non-Normal outcome, the median is the relevant figure.

(1) specifically noted detailed standard deviation considerations in the questionnaire, (2) mentioned "risk" or a synonym in a response, or (3) emphasized "diversified," "broadly based," or synonyms in describing the portfolio.*

The results described below were evaluated by using a Chi-square test with one degree of freedom in a 2 × 2 contingency table, and the calculations were adjusted for continuity. With both large samples and interval groupings, this procedure is equivalent to the use of the Z (Normal deviate) distribution. Tests were for one- or two-tailed analysis as was appropriate at various significance levels.

Both the Chi-square and the Z tests are approximations. It has been shown that exact tests for samples of smaller size yield different results.** Tables used for a small A or B sample (less than 20) or an A or B sample between 20 and 40 observations where the smallest absolute observation was less than 5 are from D. J. Finney, et al. (1963), following the procedure of Snedecor and Cochran (1967).

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*An alternative to this approach is specifically to ask each respondent whether factor X was considered in the decision. This approach seems to stimulate a respondent either to say that factor was studied or to justify ignoring it. Furthermore, it may encourage a participant to think about such a factor when it was not considered. On the other hand, the choice followed here of interpreting the responses is also hazardous. There may be a loss of information (some managers very concerned with a factor may have forgotten to mention it) as well as a bias of interpretation. Subject to the considerations mentioned above, it is hoped this bias is minimal. Furthermore, in most cases, the responses were surprisingly direct and ordered. That is, the explanation for behavior when included coincided with the original objectives noted.

Separating goals and constraints in either setting is not trivial. There could be multiple responses in each of these categories. There might be situations in which there was a criterion named simultaneously as a goal and as a constraint (e.g., maximize third-year earnings per share without having a loss in any year). As the interpretation of the results below will indicate, however, the responses as categorized did tend to make sense given the outcomes presented.

**R. A. Fisher, Statistical Methods for Research Workers, (1941), paragraph 21.02, Oliver and Boyd, Edinburgh, Scotland.

Professional Background and Project Selection

Dearborn and Simon (1958) and others have presented evidence that professional identification with a particular area of business specialization is a factor influencing the manner in which an individual views a business problem. Accepting these results, one can hypothesize that (H1) finance professionals will have a higher interest than other groups in rate of return and earnings per share. One may also hypothesize (H1A) that marketing professionals will have a greater interest in sales than other professionals.

These results are presented in Table 2. For all groups, earnings per share (.92) were dominant with some concern for rate of return (.38). In terms of goals, sales and cash flow were rarely considered.

The finance group placed more emphasis on rate of return, as hypothesized. This emphasis was significantly higher (at the 10% level) than that considered by both the marketing and general management executive. Marketing executives were somewhat lower in rate of return evaluations compared to the other groups, but were not significantly different from the others in their appraisal of the importance of sales as a goal. In fact, the marketing group had a slightly lower proportion (.17) selecting sales as a major goal than any other subgroup.

The hypothesis for departmental identification being associated with differential selection of criteria is supported in the area of finance (H1). The expected identification of marketing executives with sales standards was not found (H1A).

Projects 2, 3, 4, 8, and 9 in conjunction are projects which may reveal the professionals' ability to decompose a financial problem. The first three

Table 2

PROFESSIONAL BACKGROUND, GOALS, AND PROJECT SELECTION

	Finance (N=20)	Marketing (N=12)	Production (N=22)	General Management (N=48)	Total (N=102)
Goals					
Rate of Return	.55*	.25*	.46	.31*	.38
Sales	.20	.17	.23	.21	.21
Earnings per Share	.85	1.00	.91	.94	.92
Cash Flow	.15	.17	.14	.13	.14
Other	.10	-	.09	.02	.05
Project					
2	.30	.25	.22	.10	.19
3	.20 .40**	.17 .25	.09 .27**	.04 .13**	.10 .23
4	.35***	.25	.23	.06***	.18
8	.10 .45	.17 .59	.18 .59	.25 .56	.20 .55
9	.35	.42	.41	.31	.35
7	.25	.17	.25	.17	.20
11	.75	.92	.77	.75	.78
13	.40	.67*	.32	.35*	.39
19	.65 *	.42***	.91*** *	.77	.74

Results significantly different at the 10% (*), 5% (**) or 1% (***) level, one- or two-tailed tests as per text.

Note figure following brackets on Projects 2, 3 and 4 is the proportion of participants who selected one or more of these three projects.

projects relate to new products with particular sales possibilities. The latter two projects include major plant realignments which are useful only if the three new projects are all taken in concert. Projects 8 and 9 have rates of return over 17%; however, the highest rate of return in these five proposals belongs to Project 4, with a rate of return of nearly 19%. Given the nature of the proposals, Projects 8 and 9 are mutually exclusive of Projects 2, 3, or 4. Hence, a person initially selecting projects on the basis of rate of return might well include Project 4, and then find neither Projects 8 or 9 would be permissible. Of course, Projects 8 and 9 involve greater outlays of cash. On the other hand, for those who find rate of return a compelling criterion, there is a need to escape the "trap" of taking Project 4 (with a high rate of return on a relatively small outlay), and losing Project 8 or 9 (with high return on a larger base).

The slightly higher orientation of finance executives to rate of return as a goal is reflected in project selection among these five projects, as shown in Table 2. Consistent with the expectation (and finding) that finance professionals are more interested in rate of return calculations, one may also hypothesize (H2) that they will be more likely to select a high rate of return project (e.g., Project 4). With this selection, they will lose the opportunity for a larger investment (e.g., Project 8 or 9) with a lower rate of return than Project 4 but a return which is still greater than almost any other project. The inclusion of Projects 2, 3 or 4 in total (.40) is higher than these projects' inclusion for the other professional subgroups.*

*The figure .40 is less than the simple sum of the three projects' inclusion since .40 measures the proportion of participants who selected any of these three projects. Projects 8 and 9 are mutually exclusive, and the incidence of inclusion is the sum of the two respective project frequencies.

These results are significant at the 5% level on a one-tailed test in the case of finance versus general managers. In addition, the specific inclusion of Project 4 is significantly higher, at the 1% level, for finance professionals than for general managers. This outcome indicates that the "selective filtration" of rate of return may entrap those having rate of return as a major goal losing sight of the importance of combining projects. Such an interpretation will find support from later evidence as well; those executives who specifically emphasized rate of return as a goal generally had a greater orientation toward the selection of Projects 2, 3 and 4 than 8 or 9.

Project 7 was an "intangible" project consisting of new executives' offices. This project was nominally justified on the basis of "better spirit" of executives because of the improved working environment. All groups seemed to accept this premise with equal incidence of approval. No one challenged directly the assertions relating to its desirability.

Project 11 has a very favorable impact on reported earnings in the earlier years of its life but has a low rate of return (7%). In contrast, Project 13 has a higher rate of return (11%) but a less favorable impact on earnings per share in any of the early years. These are not mutually exclusive projects. However, the rate of return increment was usually sacrificed for the favorable early impact on earnings per share. Overall, there was a two-to-one preference for Project 11 over Project 13. This reaction is consistent with the goals admitted earlier, and is a pattern which appears consistently across all groups. The marketing group does tend to have more interest in Project 13 than the other groups on a two-tailed test.

Project 19 involves "social responsibility" or "enlightened self-interest" depending on one's view of business leadership. It is a smokestack precipitator with no rate of return in nominal terms. It has been suggested to the firm by the mayor of the town as an investment the company should consider. Three groups accepted the project overwhelmingly, but a majority of the marketing executives rejected the claims for social responsibility. Although one might expect production executives (who are largely from engineering backgrounds) to be less sensitive to this issue, in fact they were markedly more receptive. This acceptance may derive from their awareness of the technological feasibility coupled with personal experience in confronting exactly this sort of project. No explanation of the higher rejection by the marketing executives relative to other groups will be attempted!

Regional Background and Project Selection

Among the studies of comparative management values of managers from different cultures, England and Lee (1971) used questionnaires to seek differences in values among American, Japanese and Korean managers. The raw scores which resulted could be used to assess not only which goals were most relevant for particular managers, but how the managers from different cultures valued goals.

In the comparison of American and Japanese managers, for example, the maximization criteria in the context of Simon (1964) for American managers were productivity, organizational efficiency and profit maximization. For Japanese managers, the maximization criteria were productivity and organizational growth. If this pattern is repeated in relation to the SIFT model here, one might suggest that some managers stratified by regional background would

have a greater concern for sales (organizational growth or industry leadership) than other managers. Another group might emphasize earnings, which would have direct impact on profit maximization in the England and Lee terms.

The "Commonwealth" grouping included the United Kingdom to Australia geographically, on the basis of a common business heritage in practice and in education. One may hypothesize that (H3) Americans will be more concerned about earnings per share than other groups, given the "stock market orientation" of this country. Similarly, (H3A) Europeans and Commonwealth participants will be more interested in cash flow and sales, standards for the long-range viability of a business, as opposed to EPS, which, given the three-year horizon of the SIFT model, may be regarded as less important.

Although one cannot evaluate this issue with finality, it seems probable that such distinctions are blurring with the internationalization of business experience. This test group, given their backgrounds and the educational program in which they were enrolled, is likely to be less distinctive along these culturally determined lines than managers at large. They are also likely to be representative examples of future executives.

As shown in Table 3, Americans were substantially less interested in cash flow than the other groups, as hypothesized. Europeans were less interested in sales as a goal, contrary to the hypothesis.* The results found in goals (emphasis on rate of return and earnings per share) in the regional groupings is consistent with that found in the segmentation by professional background.

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*Separate tabulation indicated that the incidence of professional backgrounds when cross-tabulated by regional background was not significantly different from that of the total sample.

Table 3

REGIONAL BACKGROUND, GOALS, AND PROJECT SELECTION

	U.S. (N=69)		Commonwealth (N=13)		Europe (N=15)	
Goals						
Rate of Return	.36		.39		.40	
Sales	.22		.31		.07	
Earnings per Share	.90		.92		1.00	
Cash Flow	.07***		.23		.33***	
Other	.06		.08		-	
Project						
2	.15**	.16**	.46**	.54***	.07**	.13*
3	.06**		.31**		.07	
4	.10***		.46***		.13	
8	.18	.57	.23	.38	.27	.74
9	.39		.15		.47	
7	.20		.07		.33	
11	.72		.85		1.00	
13	.43*		.39		.13*	
19	.77		.54		.73	

Results significantly different at the 10% (*), 5% (**) or 1% (***) level, one- or two-tailed test as per text.

In terms of the five projects which involve a rate of return bias (Projects 2, 3, 4, 8, and 9), the Commonwealth participants had an especially strong inclination to select one or two of the separate projects and to avoid the higher rate of return on a large asset base from investing in either Project 8 or 9. Since there was an a priori assertion of greater interest in rate of return by regional subgrouping, a two-tailed test is applied and the difference is significant.

On the other hand, this Commonwealth group rejected the intangible argument for the new headquarters building (Project 7) more strongly than the other groups. The pattern indicating preference for earnings in Project 11 over rate of return in Project 13 continued, with the Europeans rejecting the low earnings of Project 13 more frequently than the Americans at the 10% significance level. In terms of social responsibility, the Commonwealth participants were somewhat lower in their interest in the smokestack precipitator (.54) than either the Americans or the Europeans (.77 and .73, respectively).

Such differentials may suggest characteristics of the capital markets and educational programs. The heavy emphasis on simple earnings in some environments was expected (H3) to cause this factor to be overemphasized by those respondents (the Americans). This was not observed. Greater interest from non-U.S. participants in cash flow considerations was found in the case of the Europeans as hypothesized (H3A). Since many of the Commonwealth participants are from nations where the impact of the environmentalist movement has been less substantial than Western Europe and the United States, one might conceivably explain the lower interest in the smokestack precipitator (Project 19). On balance, there is minor evidence on the differential standards for portfolio selection, for risk, and for project selection when the results are

stratified by regional background. There is no evidence that the "rate of return trap" projects found in the Commonwealth results derived from a sharp interest in rate of return as a goal. The differences are not of major importance in contrast to the England and Lee results.

The previous tables were based on the full sample of usable responses (102). For the following tables, the results will be based on a subgroup for which detailed independent responses on both the (A) and (B) packages were available. As discussed earlier, the (B) package provided additional information regarding the covariance among projects on various criteria and permitted optional use of the SIFT computer program to evaluate interrelationships.

Goal Evaluation

Given the availability to use the computer and data which would permit evaluation on many more criteria, one can hypothesize (H4) that more goals will be considered. In contrast, other observers would argue that the reason a manager has multiple goals is that (s)he has little confidence in the information or the evaluative procedures on the few goals which are very important and that multiple goals are a means of eliminating imprecisions in the system. Accordingly, when a device to handle the important information is made available, one would argue under this theory that fewer goals would be mentioned; the executive now has the means to focus on the goals of real importance.* Thus, both explanations seem plausible.

The result is inconclusive; there was no significant difference in the number of goals mentioned in the (A) (142 goals) and (B) (129 goals) cases.

*See, for example, the Cyert and March (1963) concepts of quasi-resolution of conflict, and the idea of multiple goals which are very imprecisely fulfilled and traded off against each other.

These results contrast with Marris (1963), in that the goal to which most participants turn initially is also the goal selected subsequently: earnings per share. This goal so clearly dominates others as a major idea of the participants that the desertion of high rate of return projects for those projects with high earnings impact is readily apparent.

Goal Achievement - EPS

In Tables 4 to 6, one may consider particular projects which might indicate significance of goal fulfillment given certain criteria as a major standard. Calculations based on both the (A) case and the (B) case are shown.

Project 11 has a very favorable EPS impact and Project 13 has a high rate of return and diversification possibilities. As can be seen in Table 4, in the (A) case, Project 11 was more frequently selected by both EPS and non-EPS goal groups. Furthermore, there was a more than proportionate inclination on the part of the EPS group to accept this project with high EPS, as expected, although the difference is not statistically significant. Since there was a large overlap between EPS and rate of return groups in the sample, the selection of these projects implies that the EPS and ROR group together selected these projects more than the non-EPS/non-ROR groups did, which is also consistent.

Project 12, which has a 4.8% rate of return but good earnings per share impact, shows no difference in frequency of selection in the (A) case. Project 20 is included much more frequently in the EPS-oriented participants' portfolios, reflecting favorable reaction to the high EPS contribution of this low rate of return (4.1%) project.

In the (B) case, the small size of the non-EPS groups makes tests of significance difficult. The methodology noted earlier allows such

Table 4

GOAL ACHIEVEMENT - EARNINGS PER SHARE

	(A) CASE		(B) CASE	
	P(X|-EPS)	P (X|EPS) #	P(X|-EPS)	P (X|EPS) #
	(N=21)	(N=47)	(N=4)	(N=64)
Project Number (X)				
11	.32	.49	.25	.78 **
13	.21	.34	.50	.34
12	.18	.17	0	.44 *
20	.05	.21*	.50	.78

The frequently of project's inclusion in portfolio if a major criterion was EPS [P(X | EPS)] or was not EPS [P(X | -EPS)]

Results significantly different given EPS as a criterion at the 10% (*) and 5% (**) levels, one-tailed test.

evaluation, however. As far as the acceptance of Project 13 is concerned, there is little difference among groups. Acceptance of the high EPS-impact Project 11 is significantly greater for the EPS group (.78) versus the non-EPS group (.25) on a one-tailed test. Project 12, with a similar high EPS impact also has higher acceptance at the 10% level among participants favoring EPS (.44) than among those not particularly concerned with EPS (0). Project 20 continues its general acceptance with the EPS group favoring it more than the non-EPS group.

In terms of goal fulfillment and consistency for those selecting earnings per share, the key project comparisons indicate consistency. With earnings per share as a goal, there was heavy determination to select projects which met that goal. This fulfillment was achieved even when there were low rates of return on those projects, a selection conflicting with the goal named second most frequently by the same participants.

Goal Achievement - Rate of Return

The exhibits were couched in terms of net present value although results were also presented for the internal rate of return and profitability index. The computer output and the tables accompanying the (B) case were stated exclusively in net present value terms. However, more than 80% of the participants referred to rate of return rather than net present value when evaluating projects. Such a reaction indicates the difficulty of accepting the meaning of net present value. It is consistent with the expectations of many observers of business, who know the disinclination of a manager to accept a concept foreign to his sensibilities; rate of return is a familiar concept based on bond yields or debt rates. Accordingly, one can expect (H5)

that rate of return will be used as a criterion more than net present value. This behavior can be seen again in the comparisons of the frequencies of inclusion of Projects 5 and 6. These two projects are mutually exclusive projects with alternate rankings on rate of return and net present value.

	Rate of Return	Net Present Value	Entry Cost
Project 5	11.9%	$ 80	$1,000
Project 6	11.2	109	2,000

In the (A) case, those having the rate of return as a criterion had a slight preference for either Project 5 or Project 6 than other groups. However, all participants consistently favored Project 5 (with a higher rate of return) over Project 6 (with a higher net present value) at the 1% level on a one-tailed test based on data in Table 5. This result is consistent with their responses being phrased in terms of the rate of return. Because of the differences in entry costs this selection is likewise consistent with their favoring a project with a higher rate of return on a small asset base. In the (B) case, this pattern continues.

In terms of the five projects with a high rate of return on an initial project causing the rejection of much larger projects because of their mutual exclusivity, there is mixed evidence to support a hypothesis (H2A) that those participants favoring rate of return were myopic. Projects 8 or 9 were actually selected more frequently in (A) by the ROR group and Projects 2, 3, or 4 selected less often.* Their frequency of selection of one or more of the smaller projects (2, 3 and 4) is higher at the 10% level only in the (B) case

*The frequency of Projects 8 or 9 was significantly greater in the ROR portfolio at the 10% level in (A) on a two-tailed test, contrary to a hypothesis of myopia.

Table 5

GOAL ACHIEVEMENT - RATE OF RETURN

Project Number (X)	(A) CASE P(X|-ROR) (N=25)		(A) CASE P(X|ROR)# (N=43)		(B) CASE P(X|-ROR (N=35)		(B) CASE P(X|ROR)# (N=33)	
2	.32		.21		.11		.21	
3	.12	.40	.17	.33	.06	.14	.12	.27*
4	.28		.25		.11		.21	
8	.09		.23		.27		.21	
9	.28	.37	.42	.65*	.34	.61	.30	.51
5	.52		.62		.62		.70	
6	.16		.25		.23		.12	
11	.63		.33**		.78		.72	
13	.20		.34		.30		.39	
12	.31		.09**		.49		.33	
20	.23		.12		.88		.63**	

The frequently of a project's inclusion if a major criterion was rate of return [P(X|ROR] or was not rate of return [P(X|-ROR)].

Results significantly different given ROR as a criterion at the 10% (*) and 5% (**) level, one- or two-tailed tests as per text.

compared to the non-rate of return group. Furthermore, their selection of the larger projects (with major impact on present value and an overall rate of return greater than any other major project) is likewise lower in the (B) case compared to the non-rate of return group. These results are consistent with the myopia of viewing single projects rather than portfolios. Given their standard, this selection would seem subnormal. Thus, the non-rate of return group may have resolved this issue in the (B) case. The other groups apparently did not.

In the (A) case, the projects with high earnings per share impact but low rates of return (notably Projects 11, 12 and 20) tended to be rejected by the rate of return group versus the non-rate of return group. The inclusion of Project 13 with favorable rate of return but rather weak impact on earnings in earlier years was accepted by a greater number of rate of return-oriented subjects, as expected. By the time of the (B) case, the momentum toward earnings per share as a goal by all participants (including those participants also concerned about rate of return) caused the patterns to merge. Nevertheless, Project 13 was more heavily accepted by the rate of return group, and Projects 11, 12 and 20 were less frequently accepted by this group than by others. However, all three low return projects had increased their incidence of inclusion in the portfolios of the rate of return group as well, indicating the overlap in earnings per share concern by all participants. Furthermore, there was evidence of a "satisficing" strategy: rate of return might still be important, but it was sacrificed in order to generate the required earnings impact.

Goal Achievement - Sales

Projects 5, 6, 7, 15, 16, 18, and 19 have no impact on sales. They are cost reduction projects which have a favorable performance on criteria such as earnings or rate of return. In the (A) and (B) cases, there seems to be no significant difference in the level of acceptance of these projects between the sales and non-sales groups (Table 6). Again, the searching and quasi-fulfillment of goals described by Cyert and March (1963) is consistent with this outcome, for the sales increase standard is achieved by the inclusion of other projects.

Among the projects which provide substantial sales increase, the picture is different. Projects 11 and 12 have low rates of return (5% and 7% respectively), but good sales increases, although Project 12's increase only helps the first year's sales. Project 20 has a low rate of return (4%), but high earnings in the third year, and a very high contribution to sales in all years.

In the (A) case, Project 11 is accepted more frequently by sales-oriented groups but Project 12 is accepted slightly less frequently. The differential is significantly different for Project 20 (.06 for the non-sales group versus .38 for the sales group). In the (B) case, these three projects are all included with greater frequency for the sales group vis-à-vis the non-sales group.

These results weakly support the concept of goal fulfillment in the area of sales but much less significantly than in the case of earnings per share or rate of return goal fulfillment. There was no significant avoidance of projects which did not fulfill the goal in any way; projects with zero impact on sales were not significantly different in their inclusion in the

Table 6

GOAL ACHIEVEMENT - SALES INCREASE

	(A) CASE		(B) CASE	
	$P(X\mid -S)$ (N=47)	$P(X\mid S)$ # (N=21)	$P(X\mid -S)$ (N=51)	$P(X\mid S)$ # (N=17)
Project Number (X)				
5	.51	.76	.67	.65
6	.23	.19	.19	.12
7	.15	.10	.24	.18
15	.32	.43	.23	.12
16	.47	.57	.58	.65
18	.83	.76	.84	.88
19	.72	.76	.80	.65
11	.40	.52	.72	.82
12	.19	.14	.37	.53
20	.06	.38 **	.70	.94 **

The frequency of a project's inclusion in the portfolio if a major criterion was sales [$P(X\mid S)$] or was not sales [$P(X\mid -S)$]

Results significantly different at the 5% (**) and 1% level (***), one-tailed test.

portfolios of the sales and non-sales-oriented group. However, in the case of projects with low rates of return but sharp contributions to sales increases, there was greater frequency of inclusion of such projects by the sales group, as hypothesized.

Constraints on Project Selection

Nearly one-third of the participants placed a constraint on cash flow in both the (A) and (B) trials. This constraint was typically expressed as part of their goal statement; e.g., "Maximize earnings per share subject to a minimum of $X in second and third year cash flow," or "... with a 90% confidence level for a positive cash flow in the third year". The table below indicates the proportions of executives noting various restrictions on their portfolios in both trials. The rate of return constraint was often expressed as "a return no less than the firm's cost of capital," although this requirement was typically ignored in the case of a particular project when the project was especially desirable on some goal (e.g., earnings per share). The low incidence of earnings per share as a constraint was coincident with the major selection of this factor as a goal; the typical goal was maximum earnings per share, with no regard for any minimum level of earnings.

CONSTRAINTS ON PROJECT SELECTION

	(A) Case (N=68)	(B) Case (N=68)
Rate of Return	.21	.24
Sales	.12	.19
Earnings per Share	.09	.12
Cash Flow	.32	.32
Other	.09	.13

The emphasis upon cash flow as a constraint is a way for the executive to deal with two major problems: risk and intertemporal portfolio considerations. A minimum cash flow (perhaps with some confidence level) is an approach to the danger of bankruptcy. In addition, in the view of some executives, a positive cash flow was seen as providing cash for dividends, or as a means to permit additional loans from which to pay dividends. The cash flow constraint was frequently noted as being a safety factor, or a way "to handle the risk of the firm."

Aware that some of the projects might be postponed, the executives noted that there were likely to be other desirable projects which might occur in future years, and they wanted to have some minimum level of cash flow available to invest in these unknown projects and/or to convince the debt or equity markets that funds could be advanced prudently for the firm to accept the new projects. Thus, this emphasis focused upon the firm as a "cash generator" over time, in order to enable the manager to accept projects which might subsequently appear. Since the attributes of these projects were unknown, the executives gambled that reasonable proposals would appear; cash inflow was needed to have available the option of investing in those future proposals.

Goal Specification and the Concern With Risk

The cross-tabulation in Table 7 attempts to confirm that there is a positive relationship between time spent on the project evaluation process and the selection of a risk profile (H6). Given the capability for an evaluation of risk among projects in the (B) case, the number of participants who looked at risk increased dramatically for all criteria. In the (A) case, risk of projects could be evaluated, but risk of the portfolio, the only risk of ultimate concern, was not possible.

Table 7

EXPLICIT CONCERN WITH RISK

	(A) Case (N = 68)	(B) Case (N = 68)	(B) Case Without Computer Usage (N = 11)		(B) Case Substantial Computer Usage (N = 39)	
Concern with Risk in						
Rate of Return	.23	.40 **	.36	.25	.46	.44
Sales	.09	.15	.09		.23	
Earnings per Share	.24	.59 ***	.36		.67 *	
Cash Flow	.13	.26 **	.18		.38	

Results significantly different for considerations of risk in the computer and non-computer group at the 10% level (*), 5% level (**) or 1% level (***), one-tailed test.

Another hypothesis is that the computer is associated with greater risk evaluation (H4A). To review this question, the sample was segmented into those participants who did not use the computer and those who were relatively heavy computer users. Those executives without the computer had a .36 incidence of concern with risk on earnings per share, while those using the computer had a .67 incidence of concern with this risk. -Overall, there was an average incidence of the risk evaluation of .25 for those not using the computer versus .44 for those using the computer. The small number of those not using the computer makes the test for significance extremely restrictive in this case. However, there is a probable relationship at the 80% level.

Given the ability to evaluate risk, the conclusion is that the computer did help those who employed it. Other studies have previously indicated managers have concern over risk, and this study tends to indicate that given the opportunity to evaluate risk, the managers considered the information from the computer.

Risk Evaluation

One may also stratify the group based on content analysis of their standards answered in the questionnaires, where the content evaluation is based on a concern with risk. When participants mentioned "risk" on more than two of the four categories in either (A) or (B), they were considered to be concerned with risk to a high level; the tone of the comments indicated that they were generally risk avoiders. Where risk was not mentioned on any goal in either case, the participant was considered to be unconcerned with risk. This means that the group was divided into three parts. The results shown here are for those at either extreme of the risk evaluation continuum.

Project 13 has some risk-reduction qualities suggested in the verbal description given to the participants. Project 14 is the most significantly diversifying of the projects, although the nature of the diversification is most apparent to those using the computer model. In the (A) case, participants who evidenced risk as a major concern included both projects to a greater degree than other participants (Table 8). In the (B) case, again there was favor in the acceptance of Project 13. Those executives who indicated risk was a major concern also had a significantly greater inclusion of Project 14. These results are also consistent with the idea of greater evaluation of risk criteria if the information is available.

Another indicator of the manner in which risk may be evaluated concerns the selection of the confidence intervals for the portfolio results returned to the users of the SIFT computer program. Participants could require confidence intervals of 25%/75%, 10%/90%, 5%/95% or 1%/99%. In reviewing the output of the executives who used this program, the majority clearly preferred the middle ranges of confidence intervals. The lower unit (25%/75%) was specifically mentioned by some participants as being "too low to be real." The higher unit, in contrast, may seem to have such a remote chance of happening (and, correspondingly, be such a large distance in value from the expected outcome produced at their terminals) as to be meaningless. A significant minority (15%) iterated among two or more confidence intervals, selecting certain intervals for some problems and other intervals in alternate situations. For example, many were severely concerned with cash flow figures at the lower limit (a constraint), but were willing to employ a wider confidence range for earnings per share.

Table 8

GOAL ACHIEVEMENT - RISK AVOIDANCE

	(A) CASE		(B) CASE	
	$P(X \mid -RA)$ (N=35)	$P(X \mid RA)$ # (N=15)	$P(X \mid -RA)$ (N=17)	$P(X \mid RA)$ # (N=29)
Project Number (X)				
13	.28	.40	.29	.38
14	.49	.73 *	.12	.52 ***

The frequency of project's inclusion in the portfolio if a major concern was risk avoidance $[P(X \mid RA)]$ or was not risk avoidance $[P(X \mid -RA)]$

Results significantly different at the 10% (*) or 1% (***) level, one-tailed test of significance.

	CONFIDENCE INTERVAL				
	25%/75%	10%/90%	5%/95%	1%/99%	Multiple
Incidence	.04	.39	.38	.04	.15

Some managers look at risk in a "no worse than we are" option; e.g., "if our firm adds these projects, what is the probability of doing as well as we probably can do without the projects?" Since SIFT permitted the manager to view a portfolio versus the ongoing firm (Project 1) in this light, we can check how many users of the SIFT system requested this output. In fact, 14% requested such a comparison. The general orientation seemed to be that the firm was growing, did have the funds, and the task was to find a good package of projects. It seemed to the participants, then, that almost any package would be desirable versus doing nothing given that the funds were going to be raised and the attendant dilution in EPS was assured. Hence, the nature of the experiment is biased against a subject's frequent concern with this risk measure.

Leasing Versus Purchasing

This topic is one in which the finance profession is divided. Most writers agree that leasing should not increase debt capacity for the ongoing firm; however, many observers feel that the process of adjustment for leasing made by lenders and the investment community may be such as to allow greater debt capacity (see, for example, Vancil and Anthony (1959)). Most writers agree that leases should be discounted at the after-tax cost of debt (Roenfeldt and Osteryoung (1973)).

Leasing was discussed specifically but briefly in the educational program for the participants. In the table of projects, a truck fleet was

proposed which could be owned (Project 15) or leased (Project 16). The rate of return of the leased project was defined using the present value of the lease payments as the investments. If a lessor has relatively low charges to the lessee, then the appeal of this debt-like financing via a lease will provide a high rate of return if the operating cash flow itself provides a return above the implicit lease rate.* The overall rate of return of the trucks was 16.7% (Project 15). When the low-cost lease financing was included in Project 16, the rate of return was 36.6% using this specious calculation. The differential in earnings per share in the first three years was minimal for these two approaches, but the initial cash outlay required was $0 for the leasing proposal versus $400,000 for ownership. Thus, the hypothesis is in evaluating a lease proposal versus a purchase, managers viewing a rate of return, the low cash outlay, or other figures will choose the lease, other things constant (H7).

The information was there for the executives to re-evaluate the lease proposal. However, no one challenged the calculations in writing or verbally. Large majorities of all groups selected the leasing option, Project 16. This selection was significant at the 1% level for all groups except finance. Those participants with backgrounds in finance were somewhat less enthusiastic about leasing. However this favorable observation is tempered by noting that, even in this group, a two-thirds majority of those

*For example, if one invests $100 to receive a stream of $20 per year for 10 years, the rate of return is 15%. On the other hand, a lease proposal with a lessor's cost of funds at (say) 7% requiring lessee payment of $14 for 10 years yields a higher rate of return under this sort of calculation in which the investment and the financing proposals are mistakenly mixed. The financing payments are discounted at the firm's cost of capital (10%) to give an "investment" of only $86 instead of $100. Since the inflows are still $20 per year, the "rate of return" is 19%. This sort of analysis is not unusual when people analyze a lease. It is also frequently seen when people analyze major projects that have initial financing tied to them, as oil tankers.

who select one of these two projects still prefers leasing. No one objected to the budgetary treatment, nor suggested that the lenders imposing nominal debt ceilings ought to consider the lease payments. Hence, these results are consistent with the findings of Vancil and Anthony over a decade ago; many analysts may agree that leases should be considered as part of the debt of the firm, but few seem to emphasize the issue or to challenge many calculations presented about leasing.

	All	Finance	Goal of Rate of Return
	(N=102)	(N=20)	(N=39)
Project 15 (own)	.20	.20	.23
Project 16 (lease)	.59	.40	.56

Group Versus Individual Decisions

Following the analysis presented above, a new pool of executive participants were available for repeating the entire experiment. For this test, the executives were divided into five- to eight-person groups. Again, the initial information was presented without the means with which to evaluate portfolio risk considerations. However, the purpose of this test was to compare the decisions of groups versus individuals.

There were 12 groups for which paired comparisons (A evaluation and B evaluation) could be made, and 15 groups for which a portfolio evaluation could be made based on a final, (B) case decision. Hence, because of this small size, statistically significant comparisons of groups stratified by major goals, values, project selection, and attitudes toward risk could not be made. However, the sample of 15 groups could be evaluated against the individual decisions reached in the earlier tests, and those results are as noted.

Project Acceptance. The frequency of projects selected by individuals was generally repeated in the groups. In a rank correlation test, in which the rank order of frequency of selection of projects was compared for two groups, the correlation coefficient for the individual and group decisions was .86 on the (A) case and .90 on the (B) case, indicating highly similar evaluations and frequency of selection by the participants.

Goals. Some observers of business have suggested that the organization wishes to avoid conflict and operates by a quasi-resolution of conflict. If that is true, then we would expect groups of individuals to have more goals as standards for projects. Such a selection is a way of avoiding conflict. When one person feels sales are important, another is concerned with rate of return, a third favors a broadly diversified business active in many fields, and so on, the most obvious compromise is to state all of these views as "group goals." Hence, we hypothesize (H8) that groups will have more goals than the individuals.

For the 12 groups on which paired comparisons were possible, the frequency of goal selection in the (A) and (B) cases paralleled the frequency found with individuals, as shown in Table 9. However, there were two major changes. First, the inclusion of the "other" category in goals is much more frequent in the (A) and (B) trials for groups versus individuals. Second, the goals per responding unit are increased for groups, averaging 3 goals per unit versus the 2 goals which the individual typically had. Both of these differences are statistically significant.

These two changes suggest one conclusion: as a means of avoiding conflict, groups apparently tended to list as a goal almost any item any person in the group thought was reasonable whatever the inconsistency with

Table 9

COMPARISON OF GROUP AND INDIVIDUAL GOALS

	(A) Case		(B) Case	
	Individuals (N=68)	Groups (N=12)	Individuals (N=68)	Groups (N=12)
Goal				
Rate of Return	.63	.58	.49	.50
Sales	.31	.42	.25	.42
Earnings Per Share	.69	.83	.94	.92
Cash Flow	.34	.42	.21	.50
Other	.12	.75***	.01	.58***
Total Goals	142	36	129	35
Per Unit (N)	2.1	3.0***	1.9	2.9***

Results significantly different at the 1% level (***), one-tailed tests.

the other goals espoused. Hence, one person would like to see a sales increase, and that would be listed. Another group member favored steady earnings per share growth, and that would be listed. Thus, as hypothesized, the organizations (i.e., the groups) lived with plural goals, often inconsistent, resolving conflict in effect by saying, "Yes, we think your goal is important," even if that goal was directly offset by other goals. In this situation, however, all the nominal goals could be listed, and the conflict (if it arose) would be apparent only with final portfolio decision.

Lease Versus Buy. Although it was not reasonable to separate a "group" with a finance background, it was possible to complete a paired comparison between acceptance of the owned truck fleet (Project 15) versus the leased fleet (Project 16) for the total sample and for the groups selecting rate of return as a goal. The results confirm the emphasis by the participants on the lease option.

	All		Goal of Rate of Return	
	Individuals	Groups	Individuals	Groups
	(N=102)	(N=15)	(N=39)	(N=8)
Project 15 (own)	.20	.20	.23	.13
Project 16 (lease)	.59	.67	.56	.75

Social Responsibility. The incidence of acceptance of the smokestack precipitator (Project 19) was virtually identical in the (A) case for individuals and for groups, with about 75% of each group accepting it. However, in the (B) case, the groups had a lower acceptance (.50 versus .76 for individuals) although the difference is not statistically significant.

Rate of Return Versus Net Present Value. Following the pattern of the individuals, the groups favored the higher rate of return project (Project 5) over the project with the higher net present value (Project 6). From a total of 15 groups, 11 chose the higher rate of return project and 1 chose the higher net present value project.

Conclusion on the Group Choices. The main confirmation from the group experiments were the similarities in group goal standards, considerations of risk, general project selections, and specific lease, socially responsible, and rate of return project selections. However, of greater interest to the student of organizations is the markedly higher incidence of criteria named as "Goals" for the group coupled with the preponderance of vaguely defined "Other" goals.

Conclusions

In reviewing these data, one must be cautious in interpreting any differences. Where there are significant differences, one must ask whether there is a spurious relationship or whether there may be meaningful justification for such differences. This study sought to evaluate a variety of items which have been hypothesized to affect management decision making. In adding some evidence to this field, the study is designed only as evidential and not judgmental. Laboratory experiments suffer from artificiality; field experiments suffer from noncontrollability of exogenous factors and other defects. As George Homans once observed, there are neither good nor bad methods of research, only methods which have certain defects vis-à-vis others with alternative limitations. Within the confines of one laboratory method and these executives, we can find the following conclusions warranted.

First, there was consistent evidence of multiple goals, and a trade-off among those goals. This finding is generally consistent with the findings of Marris (1963) but differs in some respects. Even when the criteria were not simultaneously mentioned as constraints, however, many of the goals seemed to be satisficing goals: a reasonable level of goal fulfillment was achieved and the participant turned to other topics. This behavior is consistent with the idea of a global objective function. It is also consistent with quasi-fulfillment of goals and quasi-resolution of conflict in the terms of Cyert and March (1963). Ignoring risk, the portfolios with maximum expected net present value, rate of return, first-year earnings per share, and third-year earnings per share were determined by integer programming.* These portfolios were rarely selected by the participants in any subclassification. One can argue, of course, that the participants were unable or uninterested in truly maximizing these criteria. Alternatively, and more reasonably it would seem to this writer, one can say that the ideas of multiple goals, risk, and satisficing mentioned in evaluating their responses to the questionnaires is fully consistent with their behavior. There was a global objective function, perhaps shifting as their knowledge of the problem deepened, and requiring a variety of projects in the portfolios.

Second, a major concern was risk. It was considered when the information was available and when the means for evaluation was present. Thus, this study indicates that computers or other devices which allow a manager to evaluate risk are useful. Nothing in the model used by these

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*See Carter (1974), Appendix 8A.

executives is technologically unfeasible for the corporation; obtaining the data and training the executives to use it are the major restrictions.* The data problem is lessened with wider use of computer data bases and retention of historical information from which simulation models can be constructed. Risk was most frequently evaluated on the basis of a 5%/95% or 10%/90% confidence interval. General responses to questionnaires indicated a major concern with achieving a no-loss portfolio. Finally, the use of cash flow at some minimum level with a certain lower confidence limit was used by some executives as a way of achieving a suitable risk position vis-à-vis dividends and bankruptcy, as well as assuring available financing for unknown projects which might occur in future years.

Third, goal fulfillment seemed generally to be successful, given the idea of multiplicity of goals. Nearly all users of the computer model specifically indicated at the end of their efforts that they believed they achieved their goals. There was consistency of goals from one period to the other. Those participants especially concerned about rate of return or earnings per share had a predictably larger incidence of inclusion of projects excelling on these criteria in their portfolios. Likewise, projects especially weak on these criteria were rejected in higher proportions. In the case of sales-oriented subjects, the rejections of projects not increasing sales was no different from the non-sales-oriented group. However, the sales-oriented group did emphasize those projects significantly boosting sales in all years, indicating a one-sided view of this goal. Such a solution is consistent with satisficing, for it may well be that the sales-increasing projects were selected early to achieve certain growth rates; non-sales-increasing projects were added later for a variety of other reasons.

*See especially McSweeney (1972) (1973) for a discussion of how a complex management science model may be successfully employed in a corporation to aid in project selection at the highest levels.

Fourth, there was emphasis on earnings per share, and secondly on rate of return. "Rate of return" was preferred to "net present value." The filtering of this measure induced the selection of a small project with a very high rate of return versus a much larger project with a lower return. The combination of this difficulty with the orientation toward leasing indicates the difficulty of communicating these subtleties to individuals in simple terms. Likewise, the orientation toward reported earnings per share as the main goal reflects a concern with the public marketplace and the evaluative standards of that marketplace.

Fifth, professional bias in selection of projects was found in the area of finance. There were no consistent patterns of project selection or standards which differentiated marketing production and general management groups from each other. Such lack of differential may be explained by the "general management" orientation of the program environment and the career designs of nearly all executives sent to it, regardless of the professional backgrounds from which the subjects came.

Sixth, in terms of regional differences, there was evidence that Europeans tended to be less concerned with sales and Americans less concerned with cash flow than other groups. The lack of interest of Americans in cash flow had been hypothesized; the lower interest of Europeans in sales was not expected. Whether this outcome reflects cultural bias or educational efforts is uncertain. One hesitates to make judgments about the significantly lower interest in the "socially responsible" project by the Commonwealth participants.

Seventh, when group comparisons are included, the major difference seems to be that there are more "complex" goals listed, and groups considered

more goals in total. The data supported the hypothesis that groups will state more goals as part of their objectives as a means of avoiding conflict within the organization. Presumably, accepting a goal can be done easily on the assumption that either a conflict over a project will or will not occur. If it does not occur, accepting the goal costs nothing. If a conflict later occurs, a participant may assume that it would occur whether or not the goal were initially listed by the group; the person holding that goal would still retain it whether or not the group initially accepted it.

A summary of the particular hypotheses suggested here is presented in Table 10.

All of these observations are tempered by the nature of the testing procedure and the data. However, they do tend to provide evidence to accept or reject behavioral characteristics which have been observed or speculated upon by other researchers. Further, the evidence of risk evaluation given the information and means to evaluate it is compelling. Such evidence is important to management scientists, businessmen, and business educators. One must note that this form of risk evaluation was in a businesslike setting. It was not restricted to gambling choices or games within the realm of more mathematical models. Those experiments are important; the merit of this approach is to stress the applicability of risk evaluation in a business setting by executives.

Table 10

SUMMARY OF ELEVEN HYPOTHESES AND LABORATORY RESULTS

H1	Finance professionals will favor EPS and rate of return as goals and in risk considerations.	supported
H1A	Marketing professionals will favor sales in goal selection and risk considerations.	rejected
H2	Finance professionals will favor rate of return and will be myopic, selecting a small project with a very high rate of return project over a larger block of projects with high returns.	supported
H2A	Given rate of return as a goal, participants will favor a small project with a very high rate of return over a larger block of projects with high returns.	supported
H3	United States participants will favor EPS more than others.	rejected
H3A	Non-US participants will favor cash flow and sales as goals more than others.	supported (cash flow)
H4	Given a computer, participants will evaluate more goals.	rejected
H4A	Given the computer, participants will have more complete evaluation of risk.	supported
H5	Rate of return will be more acceptable than net present value as a standard for project acceptance or rejection.	supported
H6	Given time and information, participants will have more complete evaluation of risk.	supported
H7	Leasing is favored over purchasing given a standard NPV analysis at the cost of capital.	supported
H8	Groups will have more goals than individuals as a form of conflict resolution.	supported

BIBLIOGRAPHY

Alderfer, Clayton, T. and Bierman, Harold, Jr., "Choices with Risk: Beyond the Mean and Variance," Journal of Business, July 1970, pp. 341-353.

Baldwin, W., "The Motives of Managers, Environmental Restraints, and the Theory of Managerial Enterprise," The Quarterly Journal of Economics, May 1964, pp. 238-256.

Baumol, W., Business Behavior, Value, and Growth, Macmillan, Inc., New York, 1954.

Berg, Norman A., The Allocation of Strategic Funds in a Large, Diversified Industrial Company, unpublished doctoral dissertation, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, 1963.

Bierman, Harold and Hass, Jerome E., "Capital Budgeting Under Uncertainty: A Reformulation," Journal of Finance, March 1973, pp. 119-129.

Bower, Joseph L., Managing the Resource Allocation Process, Division of Research, Harvard Business School, Boston, Massachusetts, 1970.

Carter, E. Eugene, "The Behavioral Theory of the Firm and Top-Level Corporate Decisions," Administrative Science Quarterly, December 1971, pp. 413-428.

Carter, E. Eugene, Portfolio Aspects of Corporate Capital Budgeting, D. C. Heath and Company, Lexington, Massachusetts, 1974.

Chamberlain, Neil, The Firm: Micro-Economic Planning and Action, McGraw-Hill, Inc., New York, 1962.

Chambers, John C.: Mullick, Satinder K.; and Smith, Donald D., "The Use of Simulation Models at Corning Glass Works," in Corporate Simulation Models, edited by Albert N. Schrieber, University of Washington Printing Plant, Seattle, Washington, 1970, pp. 138-162.

Cohen, Kalman J. and Cyert, Richard M., "Strategy: Formulation, Implementation, and Monitoring," Journal of Business, July 1973, pp. 349-367.

Cohen, Michael D., March, James G., and Olsen, Johan P., "A Garbage Can Model of Organizational Choice," Administrative Science Quarterly, March 1972, pp. 1-25.

Conratn, David W., "From Statistical Decision Theory to Practice: Some Problems with the Transition," Management Science, April 1973, pp. 873-883.

Cyert, Richard M., and MacCrimmon, Kenneth R., "Organizations," in G. Lindzey and E. Aronson, editors, Handbook of Social Psychology, second edition, Addison-Wesley, Reading, Massachusetts, 1967.

Cyert, R. M. and March, J.G., A Behavioral Theory of the Firm, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1963.

Dearborn, D. C., and Simon, H. A., "Selective Perception: A Note on the Departmental Identification of Executives," Sociometry, Volume 21, 1958, pp. 140-144.

England, George W. and Lee, Raymond, "Organizational Goals and Expected Behavior Among American, Japanese and Korean Managers - A Comparative Study," Academy of Management Journal, December 1971, pp. 425-438.

Finney, D. J. et al., Tables for Testing Significance in a 2 x 2 Contingency Table, Cambridge University Press, Cambridge, England, 1963.

Fisher, R. A., Statistical Methods for Research Workers, Oliver and Boyd, Edinburgh, Scotland, 1941.

Fremgen, James M., "Capital Budgeting Practices: A Survey," Management Accounting, May 1973, pp. 19-25.

Gale, Bradley T., "Market Share and Rate of Return," Review of Economics and Statistics, December, 1972, Vol. LIV, No. 4, pp. 412-423

Gershefski, George W., "Corporate Models - The State of the Art," Management Science, Volume 16, No. 6, February 1970, pp. B303-B312.

Hillier, Frederick S., The Evaluation of Risky Interrelated Investments, North Holland Publishing Company, Amsterdam and London, 1969.

Jean, William H., The Analytical Theory of Finance, Hold, Rinehart and Winston, New York, 1970.

Katona, G., Psychological Analysis of Economic Behavior, McGraw-Hill, New York, 1951.

Keeley, Robert and Westerfield, Randolph, "A Problem in Probability Distribution Techniques for Capital Budgeting," Journal of Finance, June 1972, pp. 703-709.

Klammer, Thomas, "Empirical Evidence of the Adoption of Sophisticated Capital Budgeting Techniques," Journal of Business, July 1972, pp. 387-397.

Lanzillotti, R. F., "Pricing Objectives in Large Companies," American Economic Review, December 1958, pp. 921-940.

Mao, James C. T. and Helliwell, John F., "Investment Decision Under Uncertainty: Theory and Practice," Journal of Finance, May 1969, pp. 323-338. (Also see "Comment" by Frank Jen, pp. 342-344.)

March, J.G., and Simon, H.A., Organizations, John Wiley and Sons, Inc., New York, 1953.

Marris, Robin, "A Model of the 'Managerial' Enterprise," Quarterly Journal of Economics, May 1963, pp. 185-209.

McSweeney, James J., "A Strategic Management System - An Operational Concept," Financial Management Association meeting, San Antonio, Texas, October 1972.

McSweeny, James J., Strategic Management Systems, unpublished paper, International Utilities, January 1973.

Miller, George A., "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information," Psychological Review, Volume 63, No. 2, 1956, pp. 81-97.

Mintzberg, Henry, Ransinghani, Duru, and Theoret, Andre, The Structure of "Unstructured" Decision Processes, McGill University, Montreal, 1973.

National Industrial Conference Board, U.S. Production Abroad and the Balance of Payments, New York, 1966.

Paine, Neil R., "Uncertainty and Capital Budgeting," The Accounting Review, April 1964, pp. 330-332.

Raiffa, Howard, Decision Analysis: Introductory Lectures on Choices Under Uncertainty, Addison-Wesley, Reading, Massachusetts, 1968.

Roenfeldt, Rodney L. and Osteryoung, Jerome S., "Analysis of Financial Leases," Financial Management, Volume II, No. 1, Spring 1973, pp. 74-87.

Rotch, William, Return on Investment as a Measure of Performance, unpublished doctoral dissertation, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, 1958.

Salazar, Rodolfo C., and Sen, Subrata K., "A Simulation Model of Capital Budgeting Under Uncertainty," Management Science, December 1938, pp. B161-B179.

Schrieber, Albert N. editor, Corporate Simulation Models, University of Washington Printing Plant, Seattle, 1970.

Shaw, Marvin E. and Penrod, William T., Jr., "Does More Information Available to a Group Always Improve Performance?" Sociometry, Volume 25, 1962, pp. 377-390.

Shubik, Martin, "Approaches to the Study of Decision-Making Relevant to the Firm," Journal of Business, April 1961, 34:101-118.

Simon, Herbert A., Models of Man, John Wiley and Sons, Inc., New York, 1957.

Simon, H. A., "On the Concept of Organizational Goal," Administrative Science Quarterly, June 1964, pp. 1-22.

Slovic, Paul, "Psychological Study of Human Judgment: Implications for Investment Decision Making," Journal of Finance, September 1972, pp. 779-799.

Snedecor, George W. and Cochran, William G., Statistical Methods, sixth edition, Iowa State University Press, Ames, Iowa, 1967.

Spitaller, Erich, "A Survey of Recent Quantitative Studies of Long-Term Capital Movements," International Monetary Fund Staff Papers, March, 1971, pp. 189-217.

Vancil, Richard F. and Anthony, Robert N., "The Financial Community Looks at Leasing," Harvard Business Review, November-December 1959, pp. 2113-140.

Wallich, Michael A., Kogan, Nathan, and Bem, Daryl J., "Group Influence on Individual Risk Taking," Journal of Abnormal and Social Psychology, 1962, pp. 75-86.

Woods, Donald H., "Decision Making Under Uncertainty in Hierarchical Organizations," unpublished doctoral dissertation, Graduate School of Business Administration, Harvard University, Boston, Massachusetts, 1965.

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